



## **INFORMATION MANAGEMENT AND DECISION ARCHITECTURES**

The Information Management and Decision Architectures Branch of the Naval Research Laboratory (NRL) is seeking proposals for innovative research and development in information technology. Current and anticipated areas of research focus include:

- 1) Virtual simulations and mixed reality systems that support operational uses, situational awareness, and training, for both kinetic and non-kinetic missions. Current application areas include mobile augmented reality, virtual training environments, and interactive and automated dismounted infantry simulation and training. Research topics include information visualization techniques, adaptive user interfaces, interfaces for controlling one's avatar, multi-user distributed collaboration, system architecture and database designs, integration of novel hardware and software, training effectiveness evaluation, novel assessment techniques, adaptive training, and simulation fidelity. In all cases, NRL is interested in human factors evaluations, usability-based methodologies to quantify the costs and benefits of design choices, and understanding how system fidelity and training objectives interact and expressing results in terms of improvements in the field or live exercises.
- 2) Visual analytics systems to support multiple visual representations and multi-variate visualizations. Current work focuses on understanding of multiple data layers. Research topics include system architectures, large-scale displays (especially tiled display systems), multi-variate representations, statistical analysis techniques, and coordinated data views. In all cases, NRL is interested in human factors evaluations, new visualization metaphors, and information overload.
- 3) Information management technologies that maximize the effectiveness of an enterprise (e.g., military operations) by improving its ability to act upon information that is produced and consumed within the enterprise and externally. Technologies that are of particular interest include: data management and exploitation technologies that apply emerging mathematics and information science to improve machine processing of large amounts of data, leading to a better understanding of information presented to decision makers; tools that reduce barriers to effective information use by providing notification, mediation, access control, and persistence services; tools to assess information quality and suitability; tools that support automated management of information.
- 4) Decision architecture research that supports understanding, modeling, prototyping and evaluating effective systems that discover, process, disseminate, visualize and

present information in support of military decision making. Of particular interest is research into the following topics: identify and assess essential characteristics of decision making processes, and analyze the quality of these processes; identify and analyze the essential characteristics and parameters of decision making within application domains (e.g., C2, logistics, weather forecasting); and identify, study and specify notations, techniques, methods and tools that support understanding and improving these decision processes.

- 5) Application of multiagent research and related technologies for enhancing decision support capabilities in the Global Information Grid (GIG). Areas of interest may include, but are not limited to, new techniques in mixed-initiative interactions (e.g., human-agent collaboration) as well as the application of machine learning techniques and other artificial intelligence approaches to enable flexible multi-agent coordination and teamwork in open and dynamic environments. We are also interested in the application of game theory to model agent behaviors and interactions to gain an understanding of asymmetrical warfare environment scenarios. Related areas of interest also include new techniques for building and maintaining ontologies, new approaches for utilizing such ontologies to support subsequent agent reasoning, application of semantic web services to enable agents to intelligently discover services and the application of web service orchestration languages to enable agents to compose services. Additional areas of interest include novel and creative applications of emerging technologies such as web 2.0 for developing “mashups”, specifically for supporting collaboration between civil and military authorities in the area of Stability, Security, Transition and Reconstruction (SSTR) operations, humanitarian assistance and disaster relief operations. Other areas of interest include new techniques and approaches (particularly those that are agent-based) to improve situational awareness, particularly for the maritime domain.
- 6) Parallel and distributed simulation technology. The emphasis is on advanced Modeling and Simulation (M&S) architectures, particularly for distributed systems. The latter includes both classical cluster and shared memory architectures, as well as geographically distributed large-scale simulations. Areas of current interest include the formal description of math and physics-based models for building composable systems, natural environmental effects servers for M&S architectures, and web-based DoD technology.

Address White Papers (WP) to [nrlproposals](#). Allow one month before requesting confirmation of receipt of WP, if confirmation is desired. Substantive contact should not take place prior to evaluation of a WP by NRL. If necessary, NRL will initiate substantive contact.